

Gene name: O1-180

cDNA sequence: 1276 bp

“AAGGCGGGCGAGGCGCGGGACGCACCCATGTTCCCGGCGAG
CACGTTCCACCCCTGCCCCGCATCCTTATCCGCAGGCCACCAAAGCCGGGGATG
GCTGGAGGTTTCGGAGCCAGGGGCTGCCGACCCGCGCCCCCTCCTTCCTCCCC
GGCTACAGACAGCTCATGGCCGCGGAGTACGTTCGACAGCCACCAGCGGGCAC
AGCTCATGGCCCTGCTGTGCGGGATGGGTCCCCGGTTCGGTCAGCAGCCGTGA
CGCTGCGGTGCAGGTGAACCCGCGCCGCGACGCCTCGGTGCAGTGTTCACTC
GGGCGCCGCACGCTGCAGCCTGCAGGGTGCCGAGCCAGCCCCGACGCCCCGAT
CGGGTTCCTGTCAACCCCGTGGCCACGCCGGCGCCGGGAGATCCCCGCGATC
CTGGCAGACCGTAGCCCCGTTCTCGTCCGTGACCTTCTGTGGCCTCTCCTCCTC
ACTGGAGGTTGCGGGAGGCAGGCAGACACCCACGAAGGGAGAGGGGAGCCC
GGCATCCTCGGGGACCCGGGAACCGGAGCCGAGAGAGGTGGCCGCGAGGAA
AGCGGTCCCCCAGCCGCGAAGCGAGGAGGGCGATGTTTCAGGCTGCAGGGCA
GGCCGGGTGGGAGCAGCAGCCACCACCGGAGGACCGGAACAGTGTGGCGGC
GATGCAGTCTGAGCCTGGGAGCGAGGAGCCATGTCCTGCCGCGAGAGATGGCT
CAGGACCCCGGTGATTTCGGATGCCCTCGAGACCAGGCCTCCCCGCAAAGCAC
GGAGCAGGACAAGGAGCGCCTGCGTTTCCAGTTCTTAGAGCAGAAGTACGGCT
ACTATCACTGCAAGGACTGCAAAATCCGGTGGGAGAGCGCCTATGTGTGGTGT
GTGCAGGGCACCAGTAAGGTGTTACTTCAAACAGTTCTGCCGAGTGTGTGAGAA
ATCCTACAACCCTTACAGAGTGGAGGACATCACCTGTCAAAGTTGTAAAAGAAC
TAGATGTGCCTGCCAGTCAGATTTTCGCCACGTGGACCCTAAACGCCCCCATC
GGCAAGACTTGTGTGGGAGATGCAAGGACAAACGCCTGTCCTGCGACAGCAC
CTTCAGCTTCAAATACATCATTTAGTGAGAGTCGAAAACGTTTCTGCTAGATGG
GGCTAATGGAATGGACAAGTGAGCTTTCTCCCCTCTTCACCTCTTCCCTTTCCAA
ATTCTTCATGACAGACAGTGTTACTTGGATATAAAGCCTGTGAATAAAAGGTAT
TGCAAACAAAAAAAAAAAAAAAAAAAAA”

Figure 1

Amino Acid sequence: 361aa

"MFPASTFHPCPHYPQATKAGDGWRFGARGCRPAPPSFLPGYRQLMAAEYVDS
HORAQLMALLSRMGPRSVSSRDAAVQVNPRRDASVQCSLGRRTLQAGCRASPA
RSGSCQPRGHAGAGRSPRSWQTVAPFSSVTFCGLSSSLEVAGGRQTPTKGEGBA
SSGTREPEPREVAARKAVPQPRSEEGDVQAAGQAGWEQQPPPEDRNSVAAMQSEP
GSEPCPAAEMAQDPGDSAPRDQASPQSTEQDKERLRFQFLEQKYGYHCKDCK
IRWESAYVWCVQGTSKVYFKQFCRVCEKSYNPNYRVEDITCQCKRTRCACPVFR
HVDPKRPHRQDLCGRCKDKRLSCDSTFSFKYII"

Figure 2

01-184 cDNA sequence: 1817bp

GTCACAGCTTTCCCCTGCCCCGAATATGGTGATCTGTCTCCATTGTCCAGATCA
GGATGATTCTTTAGAAGAAGTCACAGAGGAATGCTATTCCCCACCCACCCTC
CAGAACCTGGCAATTCAGAGTCTACTGAGGGATGAGGCCTTGGCCATTTCTG
CTCTCACGGACCTGCCCCAGAGTCTGTTCCCAGTAATTTTTGAGGAGGCCTTC
ACTGATGGATATATAGGGATCTTGAAGGCCATGATACCTGTGTGGCCCTTCCC
ATACCTTTCTTTAGGAAAGCAGATAAATAATTGCAACCTGGAGACTTTGAAG
GCTATGCTTGAGGGACTAGATATACTGCTTGCACAAAAGGTTCAAACCAGTA
GGTGCAAACCTCAGAGTAATTAATTGGAGAGAAGATGACTTGAAGATATGGGC
TGGATCCCATGAAGGTGAAGGCTTACCAGATTTTCAAGGACAGAGAAGCAGCCA
ATTGAGAACAGTGCTGGCTGTGAGGTGAAGAAAGAATTGAAGGTGACGACT
GAAGTCCTTCGCATGAAGGGCAGACTTGATGAATCTACCACATACTTGTTGC
AGTGGGCCCAGCAGAGAAAAGATTCTATTCATCTATTCTGTAGAAAGCTACT
AATTGAAGGCTTAACCAAAGCCTCAGTGATAGAAATCTTCAAACCTGTACAC
GCAGACTGTATACAGGAGCTTATCCTAAGATGTATCTGCATAGAAGAGTTGG
CTTTTCTTAATCCCTACCTGAAACTGATGAAAAGTCTTTTCACACTCACACTA
GATCACATCATAGGTACCTTCAGTTTGGGTGATTCTGAAAAGCTTGATGAGG
AGACAATATTCAGCTTGATTTCTCAACTTCCCACACTCCACTGTCTCCAGAAA
CTCTATGTAAATGATGTCCCTTTTATAAAAGGCAACCTGAAAGAATACCTCAG
GTGCCTGAAAAAGCCCTTGGAGACACTTTCGCATCAGTAAGTGTGACCTCTCAC
AGTCAGACTTGGATTGCCTGCCCTATTGCCTGAATATTTGTGAACTCAAACAT
CTGCATATTAGTGATATATATTTATGTGATTTACTCCTTGAGCCTCTTGGTTTT
CTCCTTGAGAGAGTTGGAGATACCCTGAAAACCCTGGAATTGGATTCATGTT
GTATAGTGGACTTTCAGTTCAGTGCCTTGCTGCCTGCCCTAAGCCAATGTTCT
CACCTCAGAGAGGTCACCTTCTATGATAATGATGTTTCTCTGCCTTTCTTGAA
AACAACTTCTACACCACACAGCCCTGCTGAGTCAGCTGATCTATGAGTGTTAC
CCTGCCCCCTCTAGAGTGCTATGATGACAGTGGTGTAATACTAACACACAGATT
AGAAAGTTTTTGTCTGAGCTTCTGGATATACTGAGAGCCAAAAGACAGCTC
CATAGTGTCTCCTTTCAAACAACCAAATGCTCTAAATGTGGTGGGTGCTACAT
TTATGATCGGCATACCCAATGTTGCCGTTTTGTGGAAGTACTATAAGCTTGAT
TGTGAAACTGAGAAATAGAACTTAGTATTGGGGACTGATGAAATCCTAAGT
GAATGTCCACTGCTAAATGGAGCATGAAAATGTCAATCACCTAAAAGTCTGA
GATACACAGGAAAGTCAATAACTTCTGAGCTGGTGAATGGATGTTGCAT
CTGTAGAAAGTATCAAGCACTTGTAGTTTGAATGTGTTACAATAGAAGCACC
ATTTTATGAGACTGGCCCAATCTGTTGACTGCATACAATAAATCTGTTGACTT
ATTAAATTTTTAAAAAAAAAAAAAAAAAAAAAAAAA

Figure 3

O1-184 amino acid sequence: 426 amino acids

MVICLHCPDQDDSL EEVTEECYSPPTLQNLAIQSLLRDEAL AISALTDLPQSLFP
VIFEEAFTDGYIGILKAMIPVWPFPYLSLGKQINNCNLET LKAMLEGLDILLAQKV
QTSRCKLRVINWREDDLKIWAGSHEGEGLPDFRTEKQPIENSAGCEVKKELKV
TTEVLRMKGR LDESTTYLLQWAQQRKDSIHLFCRKLLIEGLTKASVIEIFKTVHA
DCIQELILRCICIEEL AFLNPYLKLMKSLFTLTLDHII GTFSLGDSEKLDEETIFSLIS
QLPTLHCLQKLYVNDVPFIKGNLKEYLRCLKKPLETLCISNCDLSQSDLDCLPYC
LNICELKHLHISDIYLCDLLLEPLGFLLERVGDTLKTLELDSCCIVDFQFSALLPAL
SQCSHLREVTFYDNDVSLPFLKTTSTPHSPAESADL

Figure 4

Gene name: O1-236

cDNA sequence: 1019bp

"GCCATATTGAGGACCTGCAGTAGAGGTGGAACCCATGACTGGCAGCGCAAAC
ACAGTGATAACAGCTGAGCTCCAAGCAAGGACCCAGGACCTTGCCTCACCACA
GACATAATCTTTCCCCACAACACCTCCACCAAGCCGCCCTGTAAATCGACATGA
GTCGCCACAGCACCAGCAGCGTGACCGAAACACAGCAAAAAACATGCTCTGG
GGTAGTGAACCTCAATCAGGAAAAGCAGACTTGCACCTTTAGAGGCCAAGGCCA
GAAGAAGGACAGCTGTAAACTCTTGCTCAGCACGATCTGCCTGGGGGAGAAAG
CCAAAGAGGAGGTGAACCGTGTGGAAGTCCTCTCCCAGGAAGGCAGAAAACC
ACCAATCACTATTGCTACGCTGAAGGCATCAGTCCTGCCCATGGTCACTGTGTC
AGGTATAGAGCTTTCTCCTCCAGTAACTTTTCGGCTCAGGACTGGCTCAGGACC
TGTGTTCTCAGTGGCCTGGAATGTTATGAGACTTCGGACCTGACCTGGGAAG
ATGACGAGGAAGAGGAGGAAGAGGAGGAGGAAGAGGATGAAGATGAGGATG
CAGATATATCGCTAGAGGAGATACCTGTCAAACAAGTCAAAAGGGTGGCTCCC
CAGAAGCAGATGAGCATAGCAAAGAAAAAGAAGGTGGAAAAAGAAGAGGATG
AAACAGTAGTGAGGCCCAGCCCTCAGGACAAGAGTCCCTGGAAGAAGGAGAA
ATCTACACCCAGAGCAAAGAAGCCAGTGACCAAGAAATGACCTCATCTTAGCAT
CTTCTGCGTCCAAGGCAGGATGTCCAGCAGCTGTGTTTTGGTGCAGGTGTCCA
GCCCCACCACCCTAGTCTGAATGTAATAAGGTGGTGTGGCTGTAACCCTGTAAC
CCAGCCCTCCAGTTTCCGGAGGTTTTTGGTGAAGAGCCCCCAGCAAGTTCGCC
TAGGGCCACAATAAAATTTGCATGATCAGGAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAA"

Figure 5

Amino Acid sequence: 207aa

“MSRHSTSSVTETTAKNMLWGSELNQEKTCTFRGQGEKKDSCKLLLSTICLGEK
AKEEVNRVEVLSQEGRKPPITIALKASVLPMTVSGIELSPVTFRLRTGSGPVFLS
GLECYETSDLTWEDDEEEEEEEEEDEDEDADISLEEIPVKQVKRVAPQKQMSIAKK
KKVEKEEDET VVRPS PQDKSPWKKEKSTPRAKKPVTKK”

Figure 6

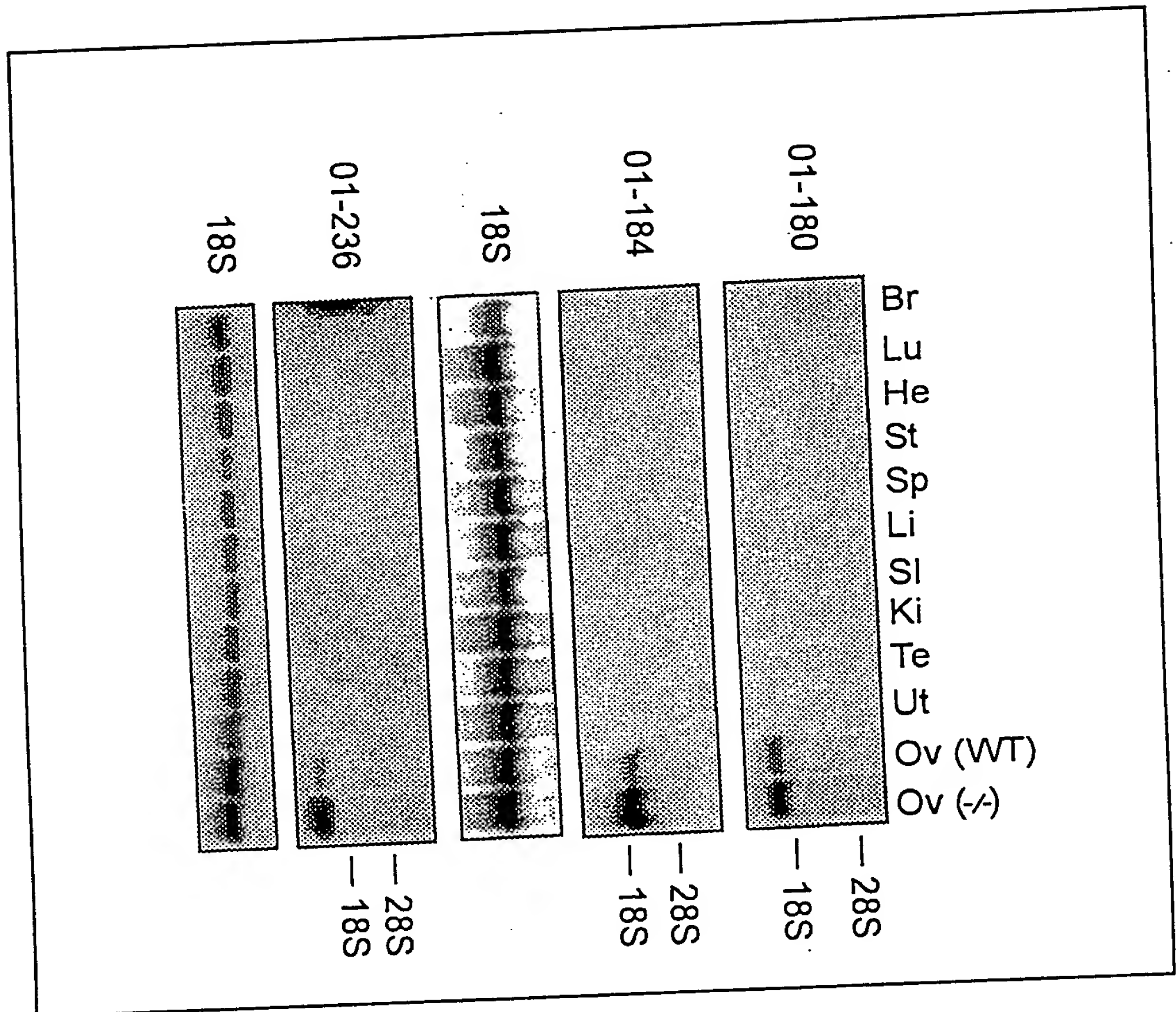


Figure 7

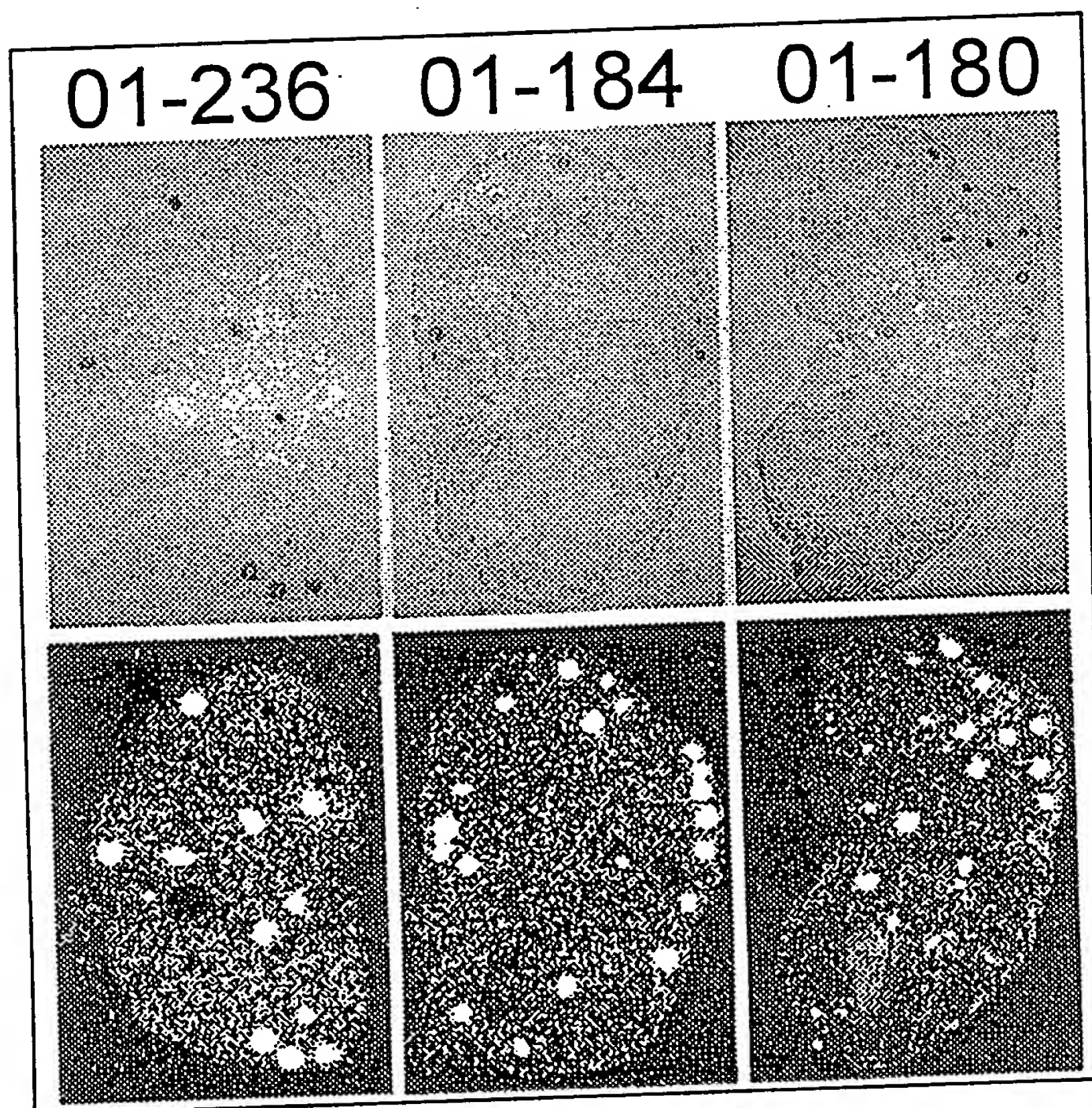


Figure 8

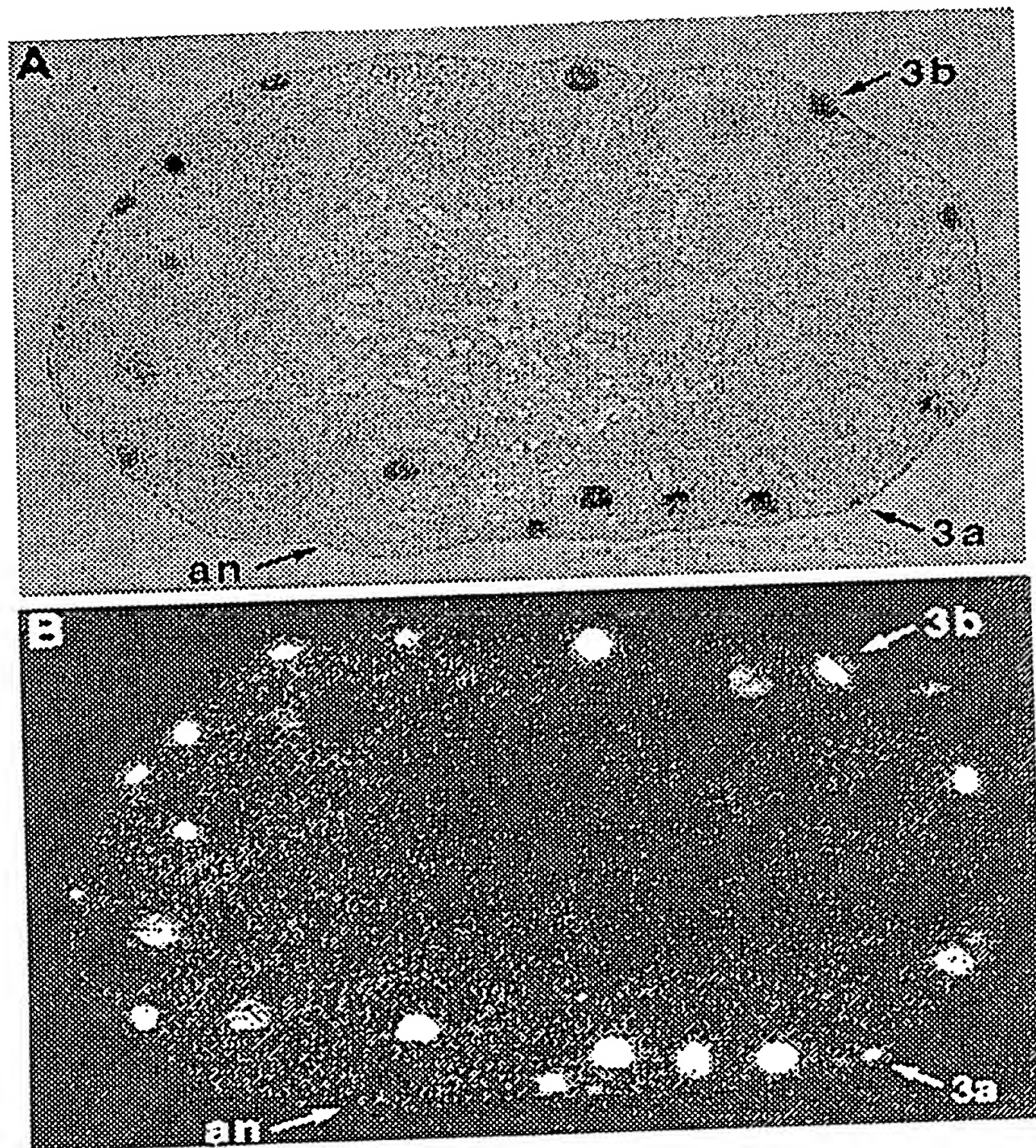


Figure 9

10/29

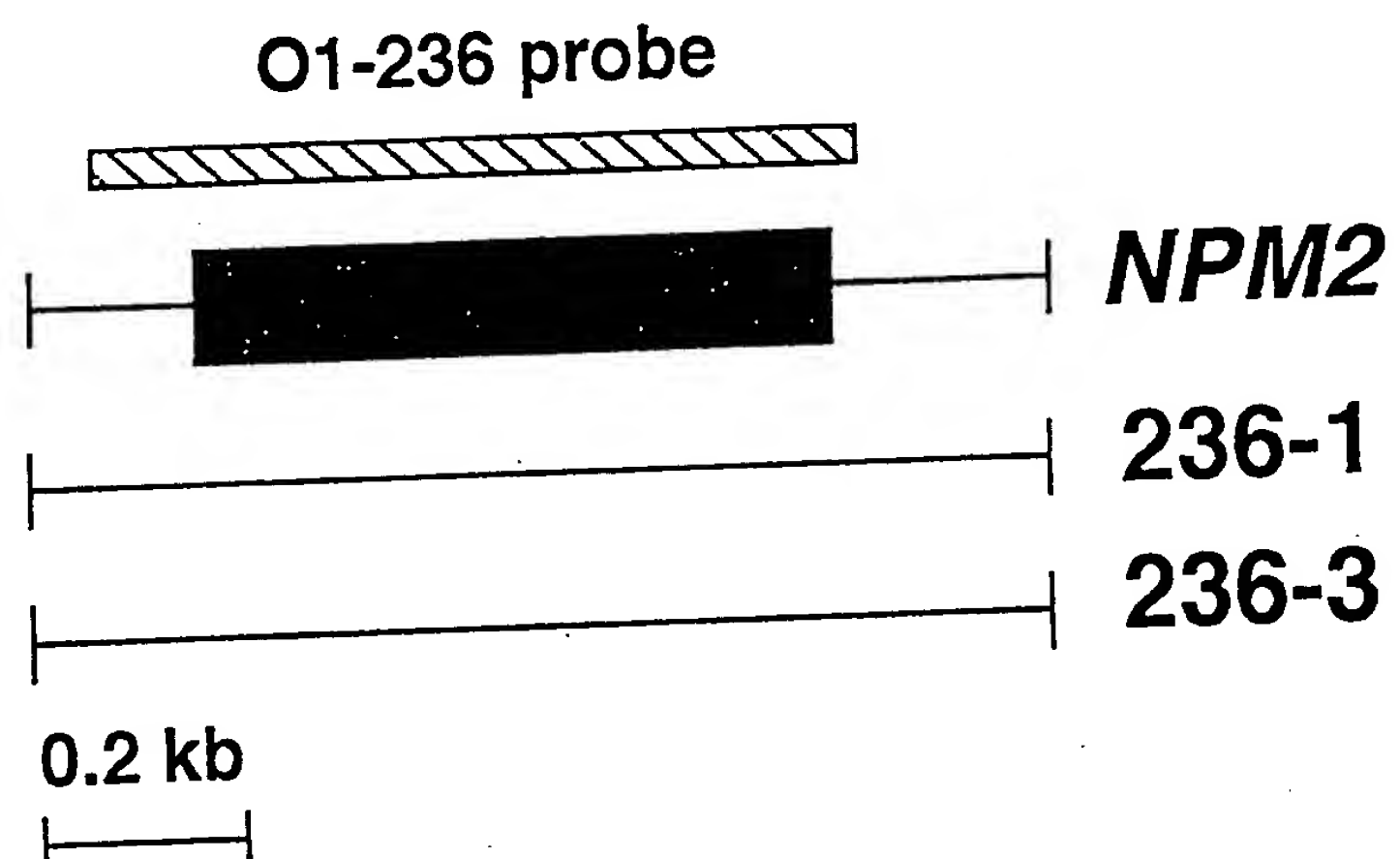


Figure 10

Npm2 MSRHSTSSVTETTAK--NMLWGSELN-QEKQTCTFRGQG-EKKDSCKLLL
 Xnpm2 MA--STVSNTSKLEKPVSLIWGCELNEQDK-TFEFKVEDDEEKCEHQLAL

PKC
 47 STICLGEKAKEEVNRVEVLSQE-GRKPPITIA~~TLKASVLPMTVSGIELS~~
 48 RTVCLGDKAKDEFNIVEIVTQEEGAEKSVPIA~~TLKPSILPMATMVGIELT~~

PKC CK2
 96 PPV~~TFRLRTGSGPVFLSGLECYETSDLTW~~~~EDDEEEEEEEEEDEDEDADI~~
 98 PPV~~TFRLKAGSGPLYISGQHVAMEEDYSWA~~~~EEDEGEAEGEEEEEEEED~~

CK2
 146 SLEEIPVKOV~~KRVAPQKQMSIAKKKKVEKEE~~DET~~VVRPSPQDKSPWKKEK~~
 147 --QESPPKAV~~KRPAATKKAGQAKKKKLDKE-DE~~-----~~SSEEDSPTKKGK~~

196 STPRAKKPVTKK 207
 189 GAGRGRKPAAKK 200

Figure 11

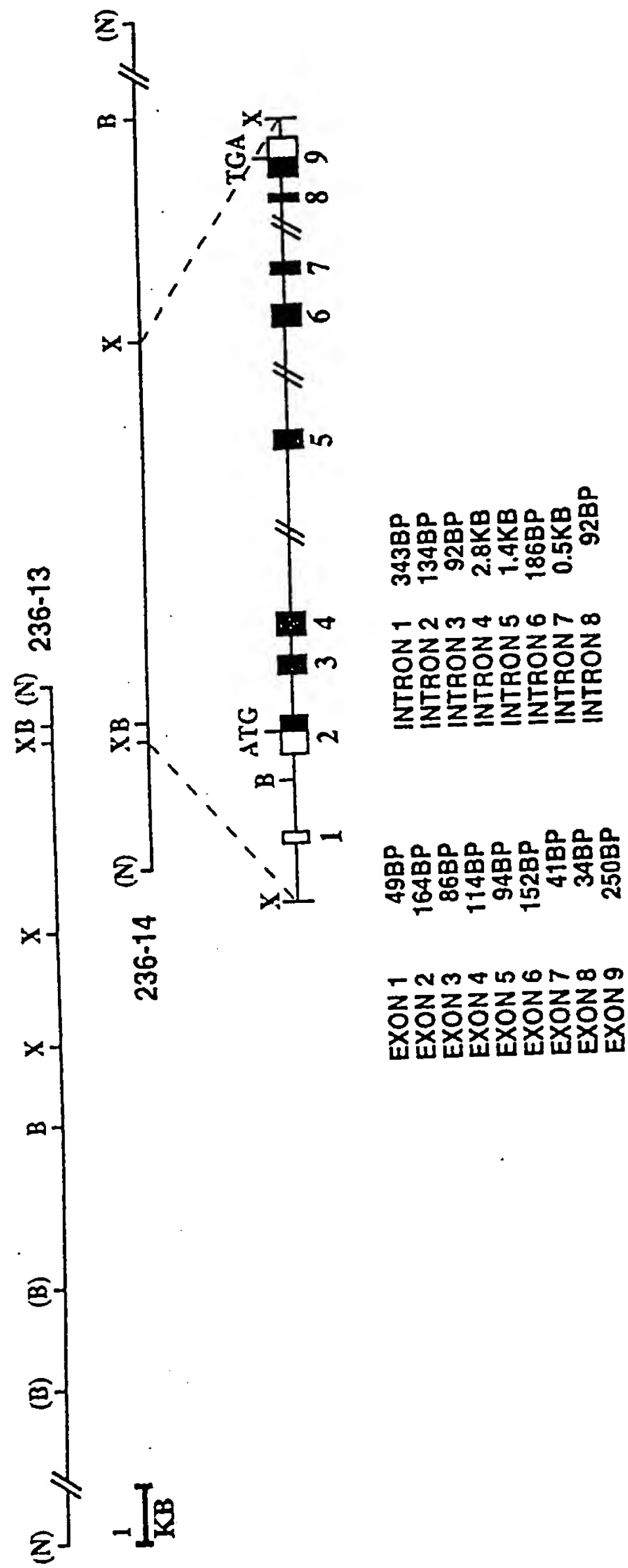


Figure 12

Mouse *Npm2* Gene Sequences

acagcagaggtgatgctcagaaatcaagttttaacagagggccagggtg
 cttctagagtaggaggggattgcacacctccccacccctcctcttc
 ccaggcttcttaacagcctgctgtgggaagctgacccttagatggagc
 cctgaaGCCATATTGAGGACCTGCAGTAGAGGTGGAACCCATGACTGG
 CAGCGCAgtaagcttgagcagg... intron 1 = 343bp
 ...ctttgcattactcagAACACAGTGATAACAGCTGAGCTCCAAGCA
 AGGACCCAGGACCTTGCCTCACCACAGACATAATCTTTCCCCACAACA
 CCTCCACCAAGCCGCCCTGTAAATCGAC ATG AGT CGC CAC AGC
 M S R H S
 1
 ACC AGC AGC GTG ACC GAA ACC ACA GCA AAA AAC ATG
 T S S V T E T T A K N M
 6
 CTC TGG Ggtaagggctaaggct... intron 2 = 134bp
 L W
 18
 ...gtcttcgctgtgcagGT AGT GAA CTC AAT CAG GAA AAG
 G S E L N Q E K
 20
 CAG ACT TGC ACC TTT AGA GGC CAA TGC GAG AAG AAG
 Q T C T F R G Q C E K K
 28
 GAC AGC TGT AAA CTC TTG CTC AGC ACGgtgggtgtctccc
 D S C K L L L S T
 40
 aa... intron 3 = 92bp ...catcacctttctcagATC
 I
 49
 TGC CTG GGG GAG AAA GCC AAA GAG GAG GTG AAC CGT
 C L G E K A K E E V N R
 50
 GTG GAA GTC CTC TCC CAG GAA GGC AGA AAA CCA CCA
 V E V L S Q E G R K P P
 62
 ATC ACT ATT GCT ACG CTG AAG GCA TCA GTC CTG CCC
 I T I A T L K A S V L P
 74
 ATGgtgagtcttctctcc... intron 4 = 2.8kb ...agaa
 M
 86
 gggggacacagGTC ACT GTG TCA GGT ATA GAG CTT TCT
 V T V S G I E L S
 87
 CCT CCA GTA ACT TTT CGG CTC AGG ACT GGC TCA GGA
 P P V T F R L R T G S G
 96

Figure 13A

108 CCT GTG TTC CTC AGT GGC CTG GAA TGT TAT Ggtaagtt
 P V F L S G L E C Y
 gtagccta... intron 5 = 1.35kb ...ggctacccattcc
 118 agAG ACT TCG GAC CTG ACC TGG GAA GAT GAC GAG GAA
 E T S D L T W E D D E E
 130 GAG GAG GAA GAG GAG GAG GAA GAG GAT GAA GAT GAG
 E E E E E E E E D E D E
 142 GAT GCA GAT ATA TCG CTA GAG GAG ATA CCT GTC AAA
 D A D I S L E E I P V K
 154 CAA GTC AAA AGG GTG GCT CCC CAG AAG CAG ATG AGC
 Q V K R V A P Q K Q M S
 166 ATA GCA AAGgtggggggaaaagaa... intron 6 = 186bp
 I A K
 169 ...tggttttgttccagAAA AAG AAG GTG GAA AAA GAA
 K K K V E K E
 176 GAG GAT GAA ACA GTA GTG AGgtaattcatgcagtt...
 E D E T V V R
 183 intron 7 = 0.5kb ... ctattcccttccagG CCC AGC
 P S
 185 CCT CAG GAC AAG AGT CCC TGG AAG AAG gtgagcaataag
 P Q D K S P W K K
 194 aag... intron 8 = 92bp ...ctcttatctgcacagGAG
 E
 195 AAA TCT ACA CCC AGA GCA AAG AAG CCA GTG ACC AAG
 K S T P R A K K P V T K
 207 AAA TGA CCTCATCTTAGCATCTTCTGCGTCCAAGGCAGGATGTCCA
 K *
 GCAGCTGTGTTCTGGTGCAGGTGTCCAGCCCCACCACCCTAGTCTGAA
 TGTAATAAGGTGGTGTGGCTGTAACCCTGTAACCCAGCCCTCCAGTTT
 CCGGAGGTTTTTGGTGAAGAGCCCCCAGCAAGTTCGCCTAGGGCCACA
 ATAAAATTTGCATGATCAGGacctccctctgcctccccctccctggat
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 acgagcaagaaaccagcccatgt

Figure 13B

T31 RH Chr 14

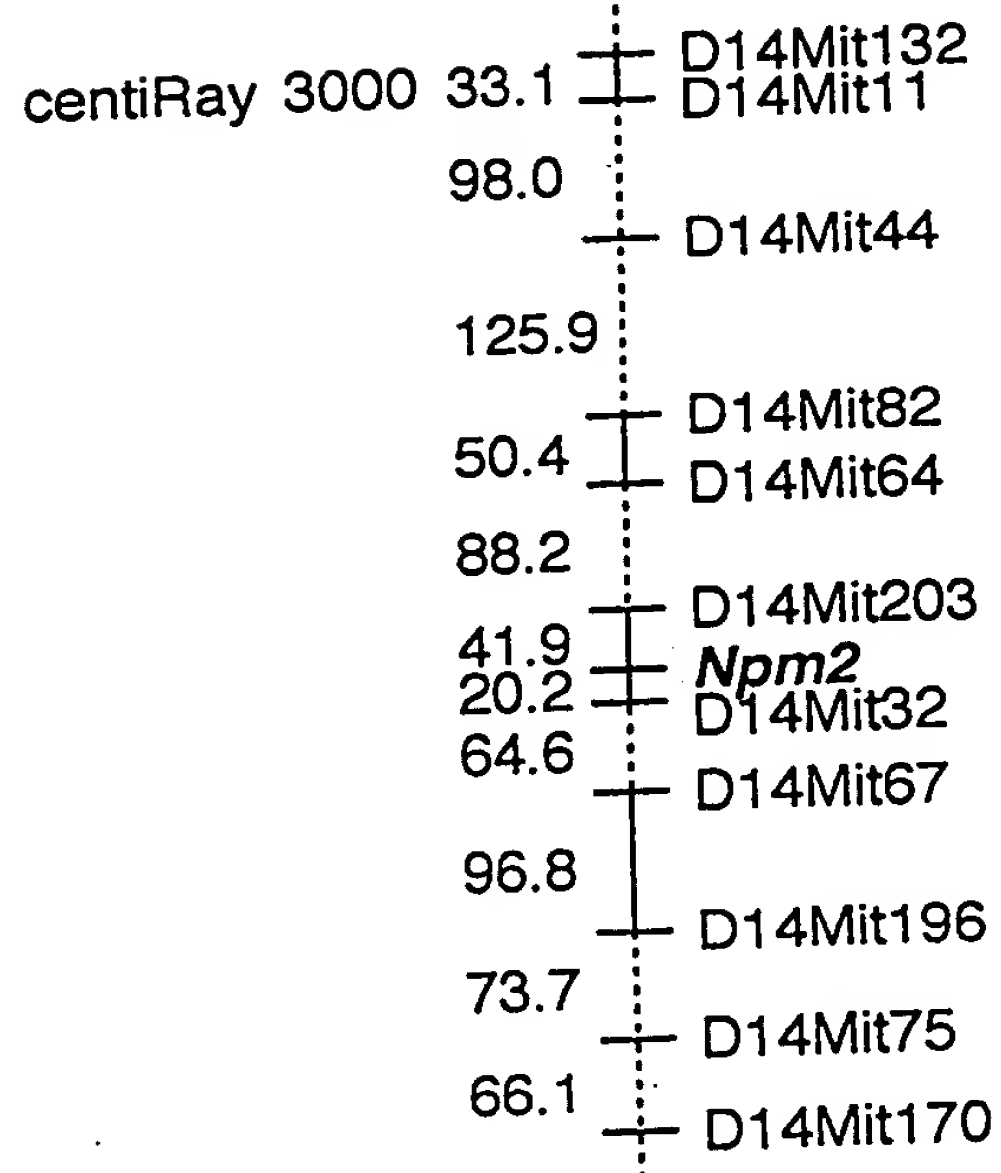
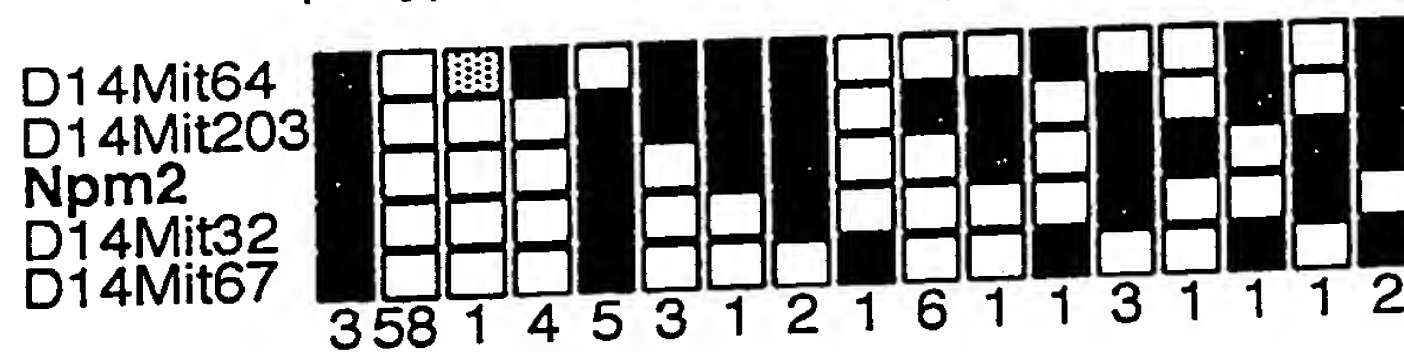
Haplotypes for T31 Chr 14 near *Npm2*

Figure 14

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hNPM2	M	N	L	S	S	A	S	S	T	E	E	K	A	V	T	V	L	W	G	C	E	L	S	Q	E	R	R	T	W	T	F	R	P	Q	L	E	G	K	Q	40	
mNpm2	M	S	R	H	S	T	S	S	V	T	E	T	A	K	N	M	L	W	G	S	E	L	N	Q	E	K	Q	T	C	T	F	R	G	Q	G	E	K	D	40		
xNpm2	M	A	S	T	V	S	N	T	S	K	L	E	K	P	V	S	L	I	W	G	C	E	L	N	E	Q	D	K	T	F	E	F	K	V	E	-	D	D	E	E	39
hNPM2	S	C	-	-	R	L	L	L	H	T	I	C	L	G	E	K	A	K	E	E	M	H	R	V	E	I	L	P	P	A	N	Q	E	D	K	K	M	Q	P	V	78
mNpm2	S	C	-	-	K	L	L	L	S	T	I	C	L	G	E	K	A	K	E	E	V	N	R	V	E	V	L	S	-	-	Q	E	G	R	K	-	P	P	I	74	
xNpm2	K	C	E	H	Q	L	A	L	R	T	V	C	L	G	D	K	A	K	D	E	F	N	I	V	E	I	V	T	Q	E	E	G	A	E	K	S	V	P	-	77	
hNPM2	T	I	A	S	L	Q	A	S	V	L	P	M	V	S	M	V	G	V	Q	L	S	P	P	V	T	F	Q	L	R	A	G	S	G	P	V	F	L	S	G	Q	118
mNpm2	T	I	A	T	L	K	A	S	V	L	P	M	V	T	V	S	G	I	E	L	S	P	P	V	T	F	R	L	R	T	G	S	G	P	V	F	L	S	G	L	114
xNpm2	-	I	A	T	L	K	P	S	I	L	P	M	A	T	M	V	G	I	E	L	T	P	P	V	T	F	R	L	K	A	G	S	G	P	L	Y	I	S	G	Q	116
hNPM2	E	R	Y	E	A	S	D	L	T	W	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	Q	158
mNpm2	E	C	Y	E	T	S	D	L	T	W	E	D	E	E	E	E	-	-	-	-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	-	149	
xNpm2	H	V	A	M	E	E	D	Y	S	W	A	E	E	E	D	E	G	E	A	E	G	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	-	149	
hNPM2	S	P	V	K	Q	V	K	R	L	V	P	Q	K	Q	A	S	V	A	K	K	K	K	L	E	K	E	E	E	E	-	-	I	R	A	S	V	R	D	K	S	196
mNpm2	I	P	V	K	Q	V	K	R	V	A	P	Q	K	Q	M	S	I	A	K	K	K	K	V	E	K	E	E	E	E	E	T	V	R	P	S	P	Q	D	K	S	189
xNpm2	-	P	P	K	A	V	K	R	P	A	A	T	K	K	A	G	Q	A	K	K	K	L	D	K	E	D	E	-	-	-	-	-	-	-	-	-	-	-	-	182	
hNPM2	P	V	K	K	A	K	A	T	A	R	A	K	K	P	G	F	K	K																						214	
mNpm2	P	W	K	K	E	K	S	T	P	R	A	K	K	P	V	T	K	K																					207		
xNpm2	P	T	K	K	G	K	G	A	G	R	G	R	K	P	A	A	K	K																					200		

FIGURE 15

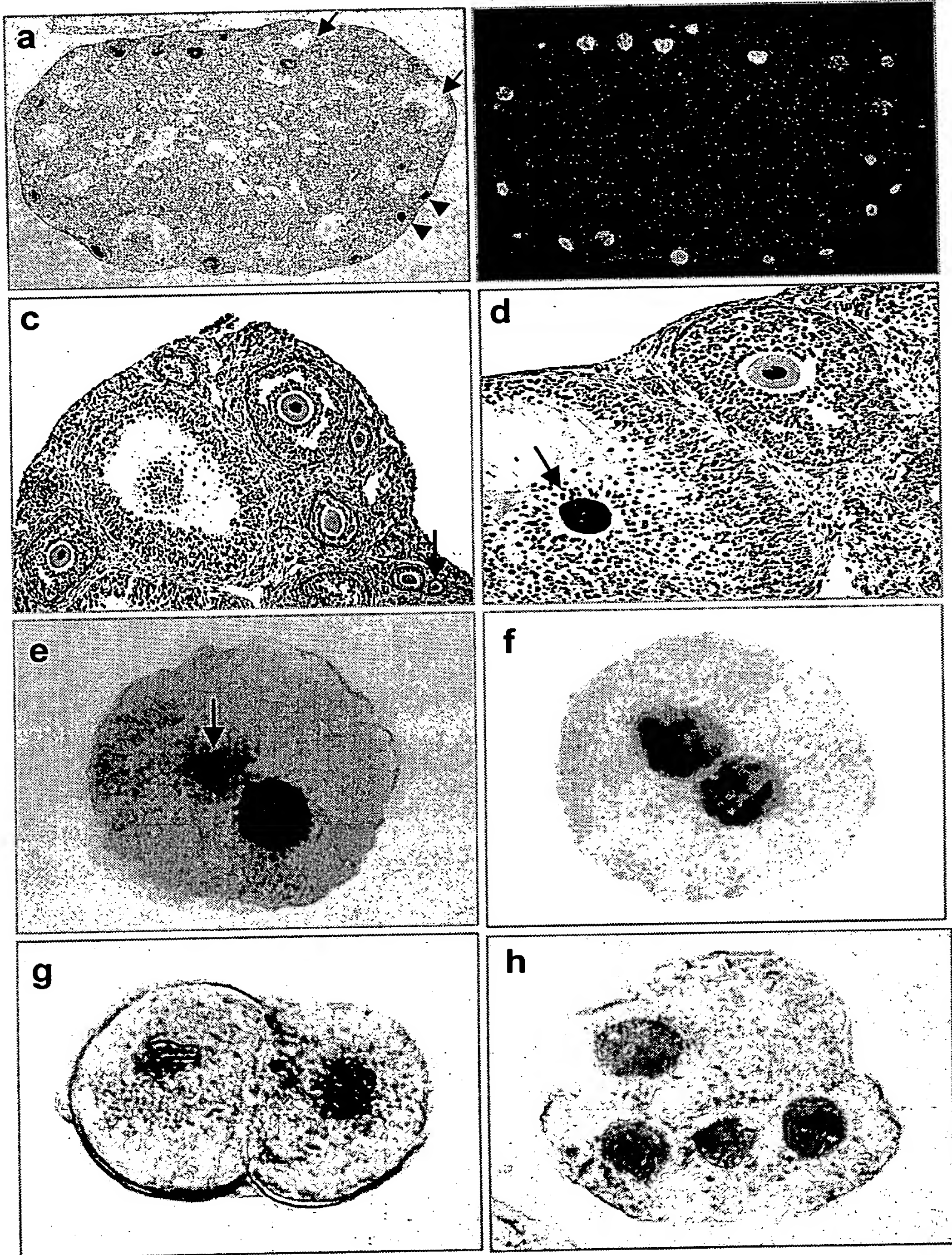


FIGURE 16



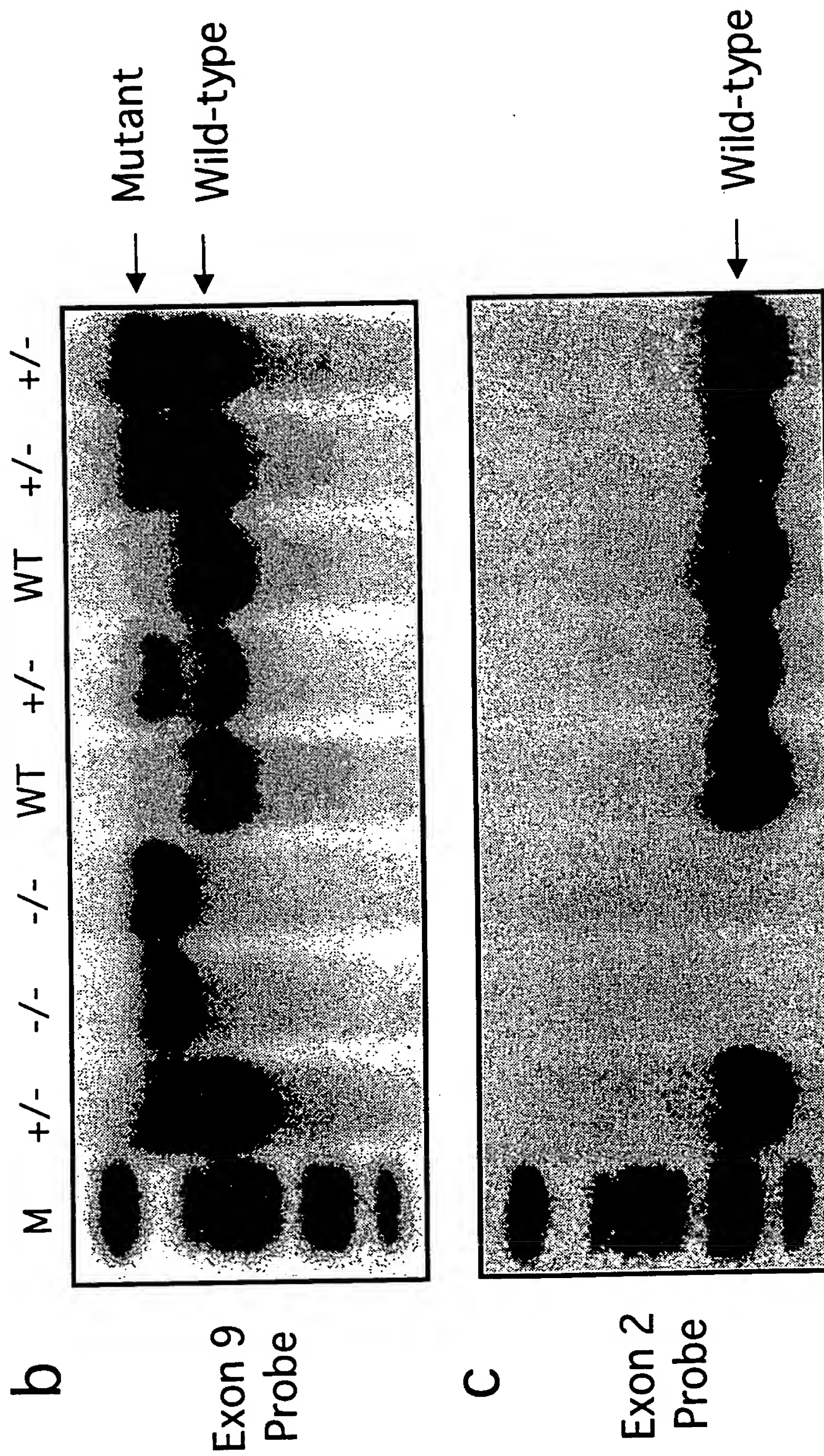


Figure 17b - Figure 17c

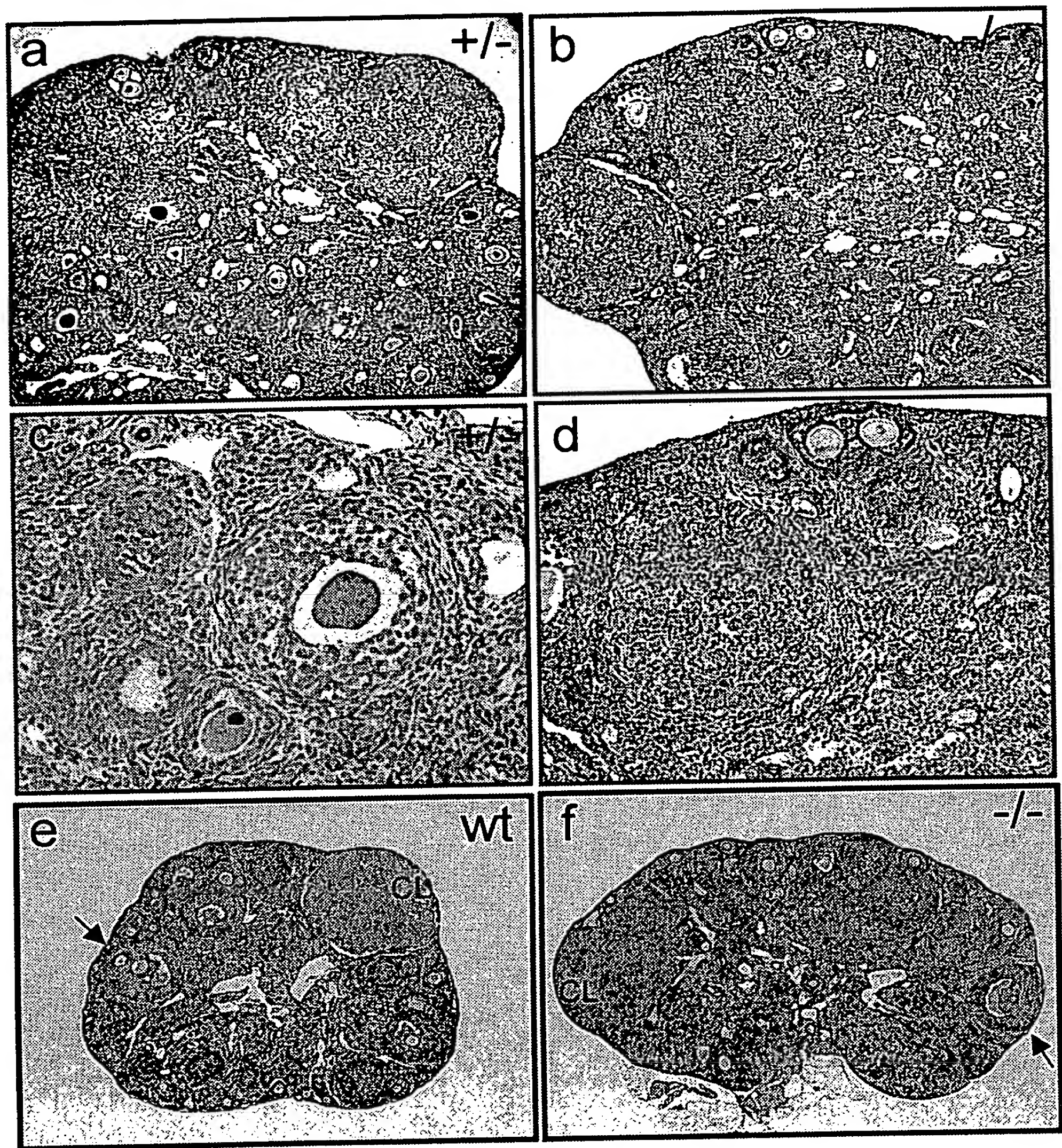


Figure 18

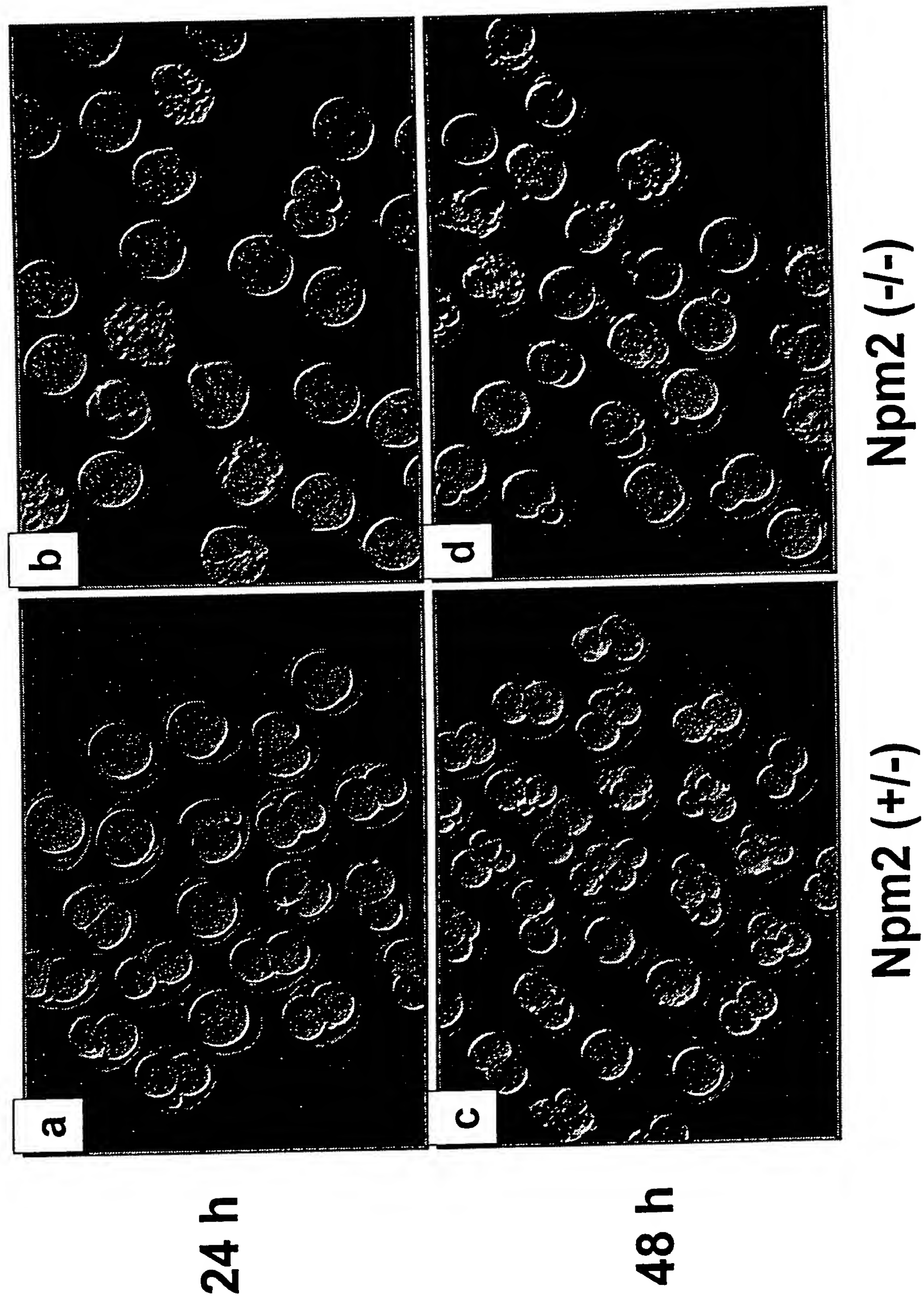


Figure 19a - 19d

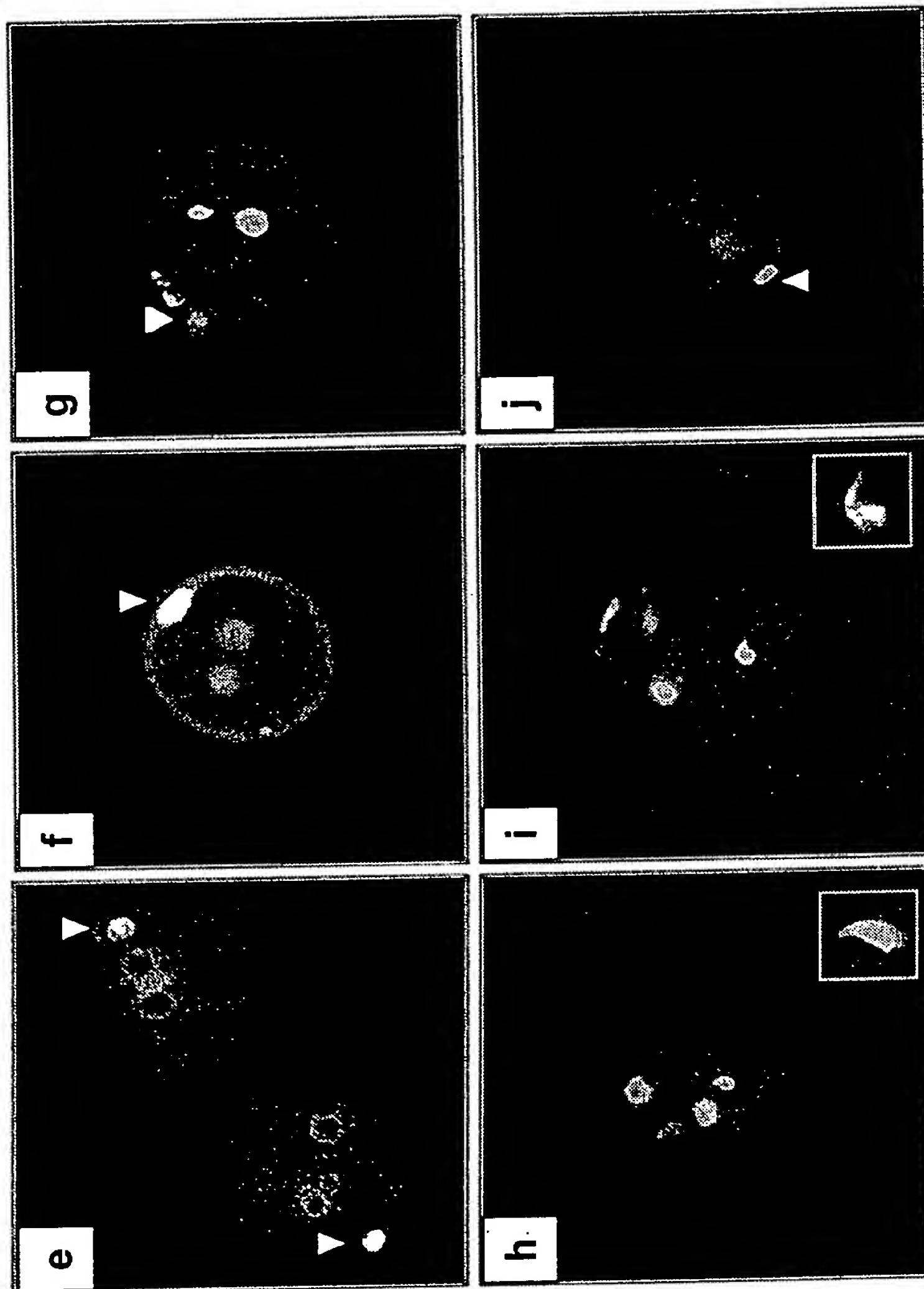


Figure 19e - 19j

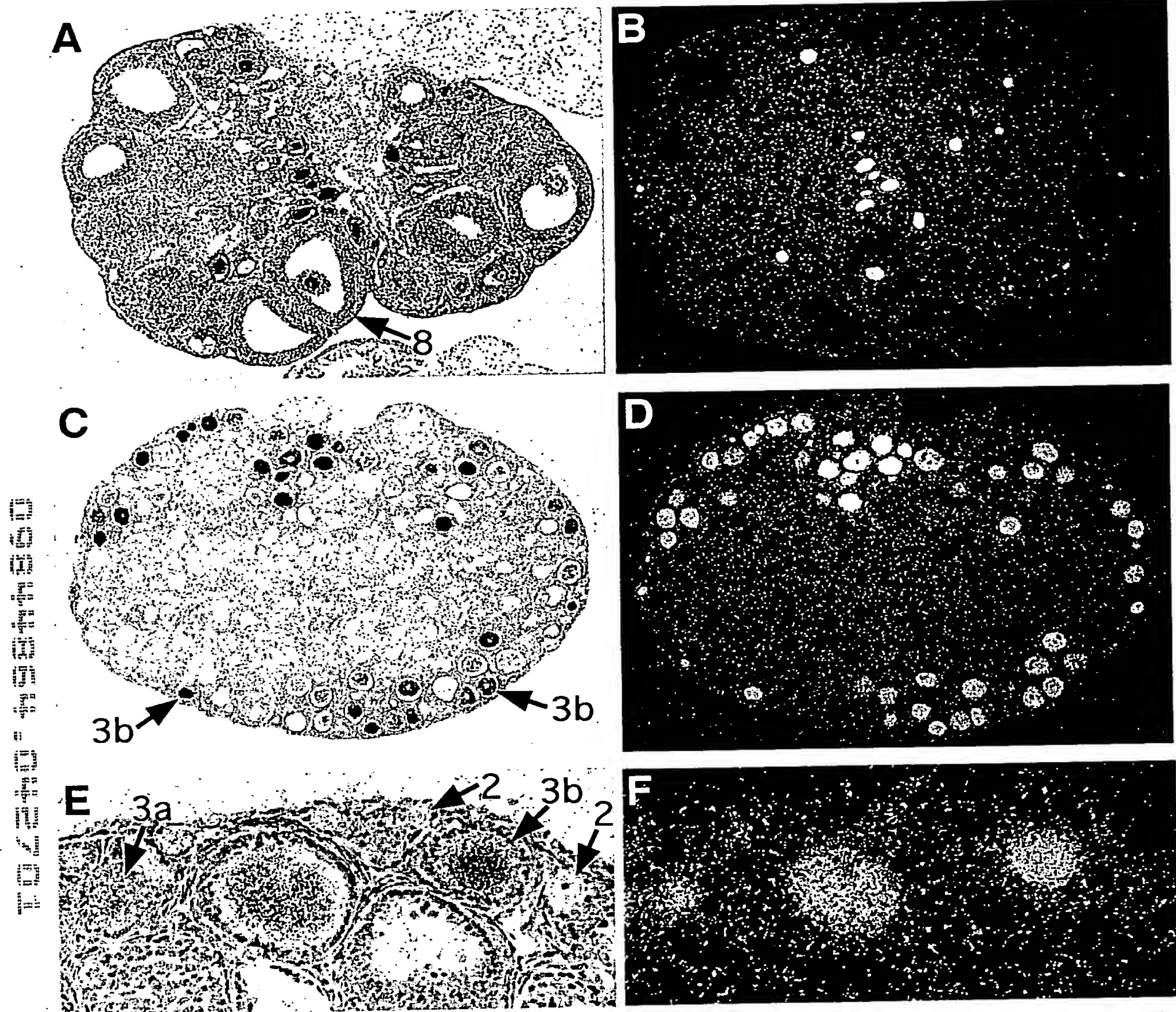


Figure 20

Oo1ps:

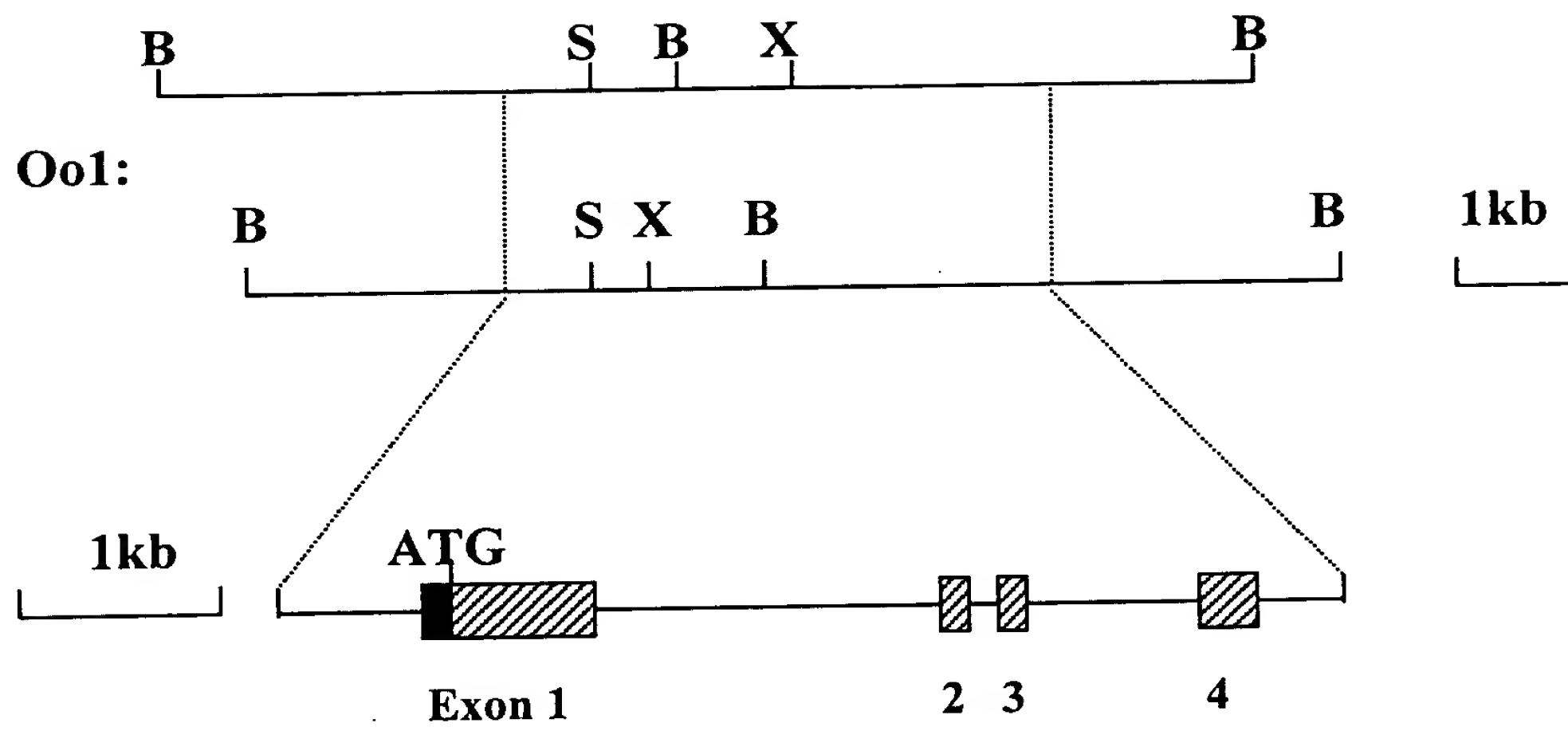


Figure 21

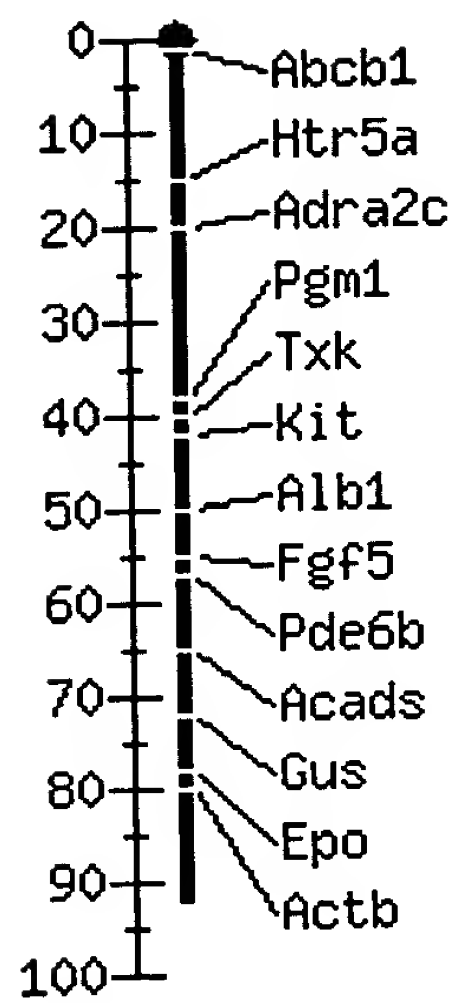
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psOo1	gene	GGCGGGCGAGGCGGGGACGCACCCATGTTCCCGGCGAGCACGTTCCACCCCTGCCCCGATCCTTATCCG	
Oo1	gene	CAGGCCACCAAGCCGGGGATGGCTGGAGGTTCCGAGCCAGGGGCTGCCGACCCGCGCCCCCTCCTTCC	140
psOo1	gene	CAGGCCACCAAGCCGGGGATGGCTGGAGGTTCCGAGCCAGGGGCTGCCGACCCGCGCCCCCTCCTTCC	
Oo1	gene	TCCCCGGCTACAGACAGCTCATGGCCGCGGAGTACGTCGACAGCCACCAGCGGGCACAGCTCATGGCCCT	210
psOo1	gene	TCCCCGGCTACAGACAGCTCATGGCCGCGGAGTACGTCGACAGCCACCAGCGGGCACAGCTCATGGCCCT	
Oo1	gene	GCTGTGCGGATGGGTCCCCGGTCCGTCAGCAGCCGTGACGCTGCGGTGCAGGTGAACCCGCGCCGCGAC	280
psOo1	gene	GCTGTGCGGATGGGTCCCCGGTCCGTCAGCAGCCGTGACGCTGCGGTGCAGGTGAACCCGCGCCGCGAC	
Oo1	gene	GCCTCGGTGCAGTGTTCACCTCGGGCGCCGCACGCTGCAGCCTGCAGGGTGCCGAGCCAGCCCCGACGCCC	350
psOo1	gene	GCCTCGGTGCAGTGTTCACCTCGGGCGCCGCACGCTGCAGCCTGCAGGGTGCCGAGCCAGCCCCGACGCCC	
Oo1	gene	GATCGGGTTCCGTGTCAACCCCGTGGCCACGCCGCGCCGGGAGATCCCCCGGATCCTGGCAGACCGTAGC	420
psOo1	gene	GGTCGGGTTCCTGTCAACCCCGTGGCCACGCCGCGCCGGGAGATCCCCCGGATCCTGGCAGACCGTAGC	
Oo1	gene	CCCGTTCTCGTCCGTGACCTTCTGTGGCTCTCCTCCTCACTGGAGGTTGCGGGAGGCAGGCAGACACCC	490
psOo1	gene	CCCGTTCTCGTCCGTGACCTTCTGTGGCTCTCCTCCTCACTGGAGGTTGCGGGAGGCAGGCAGACACCC	
Oo1	gene	ACGAAGGGAGAGGGGAGCCCGGCATCCTCGGGGACCCGGGAACCGGAGCCGAGAGAGGTGGCCGCGAGGA	560
psOo1	gene	ACGAAGGGAGAGGGGAGCCCGGCATCCTCGGGGACCCGGGAACCGGAGCCGAGAGAGGTGGCCGCTGAGGA	
Oo1	gene	AAGCGGTCCCCCAGCCGCGAAGCGAGGAGGGCGATGTTTCAGGCTGCAGGGCAGGCCGGGTGGGAGCAGCA	630
psOo1	gene	AAGCGGTCCCCCAGCCGCGAAGCGAGGAGGGCGACGTTTCAGGCTGCAGGGCAGGCCGGGTGGGAGCAGCA	
Oo1	gene	GCCACCACCGGAGGACCGGAACAGTGTGGCGGCGATGCAGTCTGAGCCTGGGAGCGAGGAGCCATGTCTT	700
psOo1	gene	GCCACCACCGGAGGACCGGAACAGTGTGGCGGCGATGCAGTCTGAGCCTGGGAGCGAGGAGCCATGTCTT	
Oo1	gene	GCCGCAGAGATGGCTCAGGACCCCGGTGATTCCGATGCCCTCGAGACCAGGCCCTCCCCGCAAAGCACGG	770
psOo1	gene	GCCGCAGAGATGGCTCAGGACCCCGGTGATTCCGATGCCCTC-----CCCCGCAAAGCACCA	
Oo1	gene	AGCAGGACAAGGAGCGCCTGCGTTTCCAGgtgaggccagcctga...intron 1 (1.8kb)... taccctgc	799
psOo1	gene	AGCAGGACAAGGAGCTCCTGCGTTTCCAGgtgaggccagcctgg...intron 1 (1.8kb)... taccctgc	
Oo1	gene	tggtcagTTCTTAGAGCAGAAGTACGGCTACTATCACTGCAAGGACTGCAAAATCCGGTGGGAGAGCGCCT	863
psOo1	gene	tggtcagTTCTTAGAGCAGAAGTACGGCTACTATCACTGCAAGGACTGCAAAATCCGGTGGGAGAGCGCCT	
Oo1	gene	ATGIGTGGIGTGTGCAGGGCACCAGTAAGgtaagagacaccgtg...intron 2 (78bp)... tctttctcct	892
psOo1	gene	ATGIGTGGIGTGTGCAGGGCACCAGTAAGgtaagagacaccgtg...intron 2 (78bp)... tctttctcct	
Oo1	gene	cgcagGTGTACTTCAAACAGTTCTGCCGAGTGTGTGAGAAATCCTACAACCCCTTACAGAGTGGAGGACAT	957
psOo1	gene	cgtag GTGTACTTCAAACAGTTCTGCCGAGTGTGTGAGAAATCCTACAACCCCTTACAGAGTGGAGGACGT	
Oo1	gene	CACCTGTCAAGtaaaccacggtt...intron 3 (878bp)...actccgatttttcagAGTGTGTAAGGAAGT	982
psOo1	gene	CACCTGTCAAGtaaaccacggtt...intron 3 (878bp)...gctctgagttttcagAGTGTGTAAGGAAGT	

Figure 22a

Oo1 gene AGATGTGCTGCCCAGTCAGACTTGGCCACGTGGACCCTAAACGCCCCCATCGGCAAGACTTGTGTGGGA 1052
 psOo1 gene AGATGTGCTGCCCAGTCAGACTTGGCCACGTGTAACCTTAGACGCCCCCATCAGCAAGACTTGTGTGAGA
 Oo1 gene GATGCAAGGACAAAATGCTTGTTCCTGGACAGCACCTTCAGCTTCAAATACATCATTTAGTGAGAGTACGA 1122
 psOo1 gene GATGCAAGGACAAAAGGCTGTTCCTGGACAGCACCGTCAGCTTCAAATACATGATTTAGTGAGAGTCGAA
 Oo1 gene AACGTTTCTGCTAGATGGGGCTAATGGAATGGACAAGTGAGCTTTCTCCCCCTCTTCCCTCTTCCCATTTC 1192
 psOo1 gene AACGTTTCTGCTAGATGGGGCTAATGGAATGGACAAGTGAGCTTTCTCCCCCTCTTCCCTCTTCCCATTTC
 Oo1 gene CAAATTCTTCATGACAGACAGTGTACTTGGATATAAAGCCTGTGAATAAAAGGTATTGCAAACA 1257
 psOo1 gene CAAATTCTTCATGACAGACAGTGTACTTGGATATAAAGCCTGTGAATAAAAGGTATTGCAAACA

Figure 22b

A



B

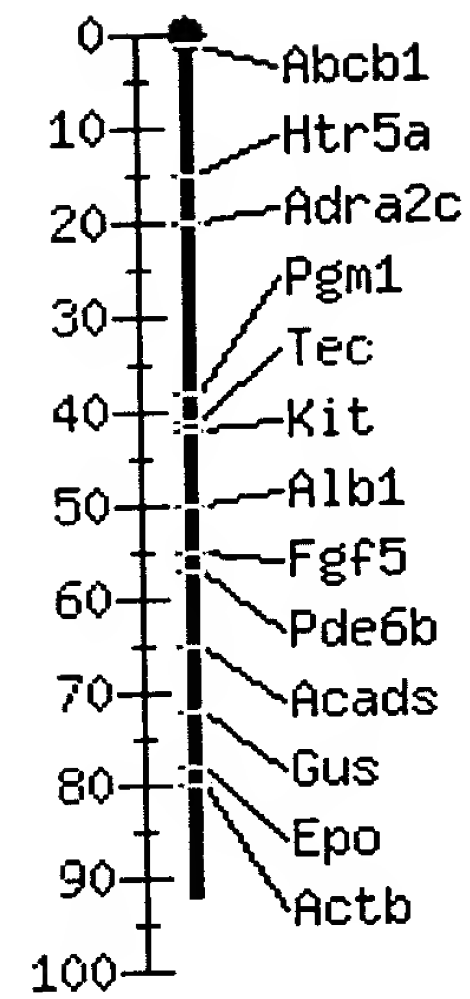


Figure 23

Oo1 Gene Targeting Strategy

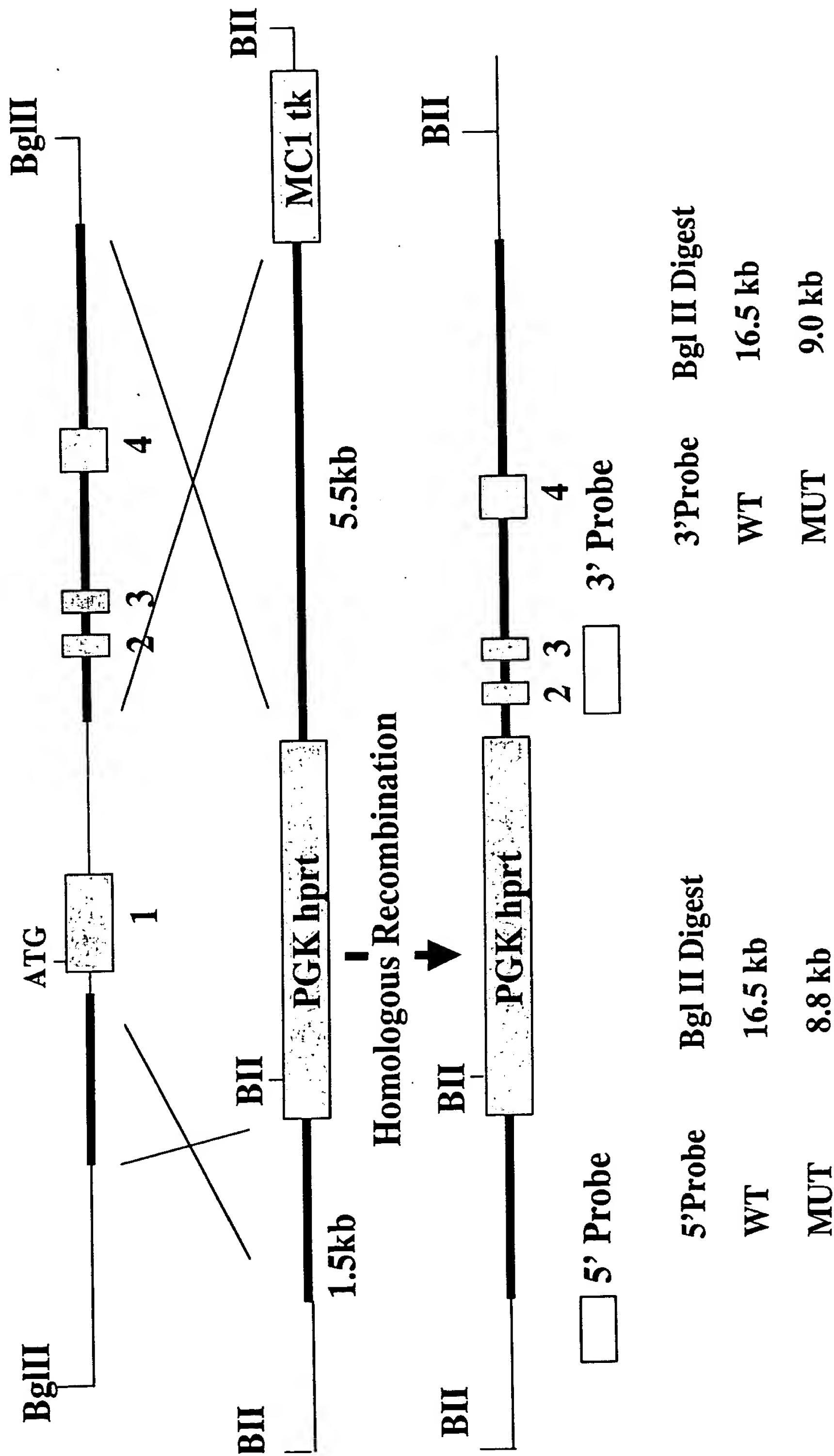


Figure 24

Human NPM2 cDNA sequence: 924bp

CAGCCCGCTT	CTCTGCCCCG	AGCCATGAAT	CTCAGTAGCG
CCAGTAGCAC	GGAGGAAAAG	GCAGTGACGA	CCGTGCTCTG
GGGCTGCGAG	CTCAGTCAGG	AGAGGCGGAC	TTGGACCTTC
AGACCCCAGC	TGGAGGGGAA	GCAGAGCTGC	AGGCTGTTGC
TTCATACGAT	TTGCTTGGGG	GAGAAAGCCA	AAGAGGAGAT
GCATCGCGTG	GAGATCCTGC	CCCCAGCAAA	CCAGGAGGAC
AAGAAGATGC	AGCCGGTCAC	CATTGCCTCA	CTCCAGGCCT
CAGTCCTCCC	CATGGTCTCC	ATGGTAGGAG	TGCAGCTTTC
TCCCCCAGTT	ACTTTCCAGC	TCCGGGCTGG	CTCAGGACCC
GTGTTCTCA	GTGGCCAGGA	ACGTTATGAA	GCATCAGACC
TAACCTGGGA	GGAGGAGGAG	GAAGAAGAAG	GGGAGGAGGA
GGAAGAGGAA	GAGGAAGATG	ATGAGGATGA	GGATGCAGAT
ATATCTCTGG	AGGAGCAAAG	CCCTGTCAAA	CAAGTCAAAA
GGCTGGTGCC	CCAGAAGCAG	GCGAGCGTGG	CTAAGAAAAA
AAAGCTGGAA	AAAGAAGAAG	AGGAAATAAG	AGCCAGCGTT
AGAGACAAGA	GCCCTGTGAA	AAAGGCCAAA	GCCACAGCCA
GAGCCAAGAA	GCCAGGATTC	AAGAAATGAG	GAGCCACGCC
TTGGGGGGCA	CGGTGCAAAG	TGGGCCTTCC	CTGGGCTGTG
CTGCAGGCAC	AGGGTGCCCC	TGTCCAGCCC	CTCCACCTGT
GTCTGAATGC	AACAGGGGTG	TTGCGGGGGC	AACATGAGAG
CCCCTCACCC	CCAACCTCTC	ACTTTCAGGA	GGCCCCCAGT
GAAGAGCCCC	ACCTCGGGGT	CACAATAAAG	TTGCCTGGTC
AGGAAAAAAA	AAAAAAAAAA	AACGTTTGCG	GCCGCAAGCT
TATG			

Human NPM2 Amino Acid sequence: 214aa

MNLSSASSTE	EKAVTTVLWG	CELSQERRTW	TFRPQLEGKQ
SCRLLLHTIC	LGEKAKEEMH	RVEILPPANQ	EDKKMQPVTI
ASLQASVLPM	VSMVGVQLSP	PVTFQLRAGS	GPVFLSGQER
YEASDLTWEE	EEEEEGEEEE	EEEEDEDED	ADISLEEQSP
VKQVKRLVPQ	KQASVAKKKK	LEKEEEEIRA	SVRDKSPVKK
AKATARAKKP	GFKK		

Figure 25